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THE MUSHROOM GROWERS'
ASSOCIATION

MGA

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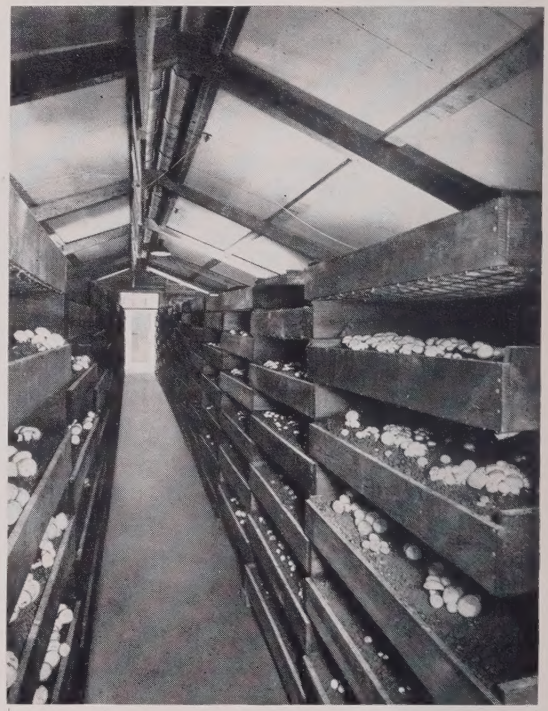

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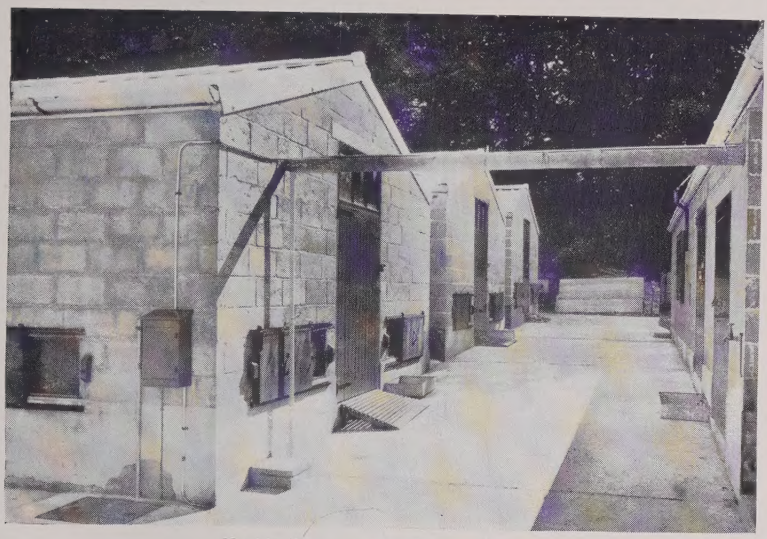

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The
MGA BULLETIN

NOVEMBER 1952
NUMBER 35

EDITORIAL:

Message from the New Chairman

My year of office as chairman of the MGA is destined to be an eventful one. The industry stands at the crossroads and progressive growers must choose between manure and synthetic composts; traditional and short composting; shelf beds or trays. In fact, **never were the possibilities so great and the future packed with such exciting new opportunities.**

Mr. H. G. BOXALL

More and more growers are beginning to move along the road to synthetic composting; some because they realise it to be the compost of the future and others by force of circumstance due to manure shortages. Much pioneer work has been done and considerable success has come to Noble Mushrooms with synthetics; to Middlebrook and Linfield with short composting; and to Stewart-Wood, Baker and Jones, and many a glasshouse grower with trays. These names come to mind first and in no way belittle the efforts of many other members who are moving forward with the times. *In all these developments the MGA and the MRA have played a great part and no progressive grower should be outside these organisations.*

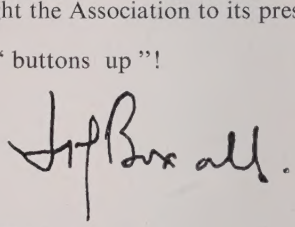
Which brings me to the organisation of the MGA and the recent Annual General Meeting. To make it clearer in the minds of some growers, the Executive Committee is now composed of twelve growers, one third of whom are elected triannually by the rank-and-file members. These twelve men should be the intelligentsia of the industry and have now been given the power to elect from among themselves the man who will preside over their deliberations. He automatically becomes Chairman of the Association. In my view no Chairman can prove his worth in a year and now, if the Committee see fit, they can retain a good chairman in office for longer than one year.

I have the agenda for the next Executive meeting before me now—it is a long one and far reaching decisions will have to be made. Your Executive members serve you well (and at their own expense), so back them up if they organise meetings or visits in your area. Do all you can

to persuade non-members to join the MGA.

When our organisation was first formed, some established growers, especially in the south, were worried lest the spread of the knowledge of mushroom growing would bring thousands into the industry with consequent over-production. To-day it is realised that, *unless a grower keeps abreast with the latest developments, he cannot hope to make mushroom growing profitable.* The MGA provides this up-to-the-minute information and we have to thank the original foresighted sponsors and the past Chairmen who have brought the Association to its present high standard.

My best wishes for 1953—and " buttons up "!



COMMENTS ON OUR HEATING NUMBER

Major D. A. Wilson : The August issue of the Bulletin is most interesting, and the collection in one issue of the various forms of heating systems provides for easy comparisons and references. This policy could profitably be extended to other subjects.

C. H. Fawcett : Mr. Burgess and I would like to congratulate you on what we feel must be a classic journal in the mushroom growers' industry. The very fair manner in which each individual system has been presented is most satisfactory to see.

Dr. R. L. Edwards : Very interesting and useful. I would have liked figures for installation cost in a specimen house of stated construction and size, using each method.

W. A. B. Harding : From a member's point of view a whole issue devoted to one subject may not be as interesting as the customary variety ; at least, that is how it affects me personally.

Angus Watson : I think one special subject each year could most usefully be dealt with in the same way.

S. Middlebrook : The studies were far too superficial to be helpful.

T. T. Leach: Personally, and with due deference, I think an occasional such Bulletin would be acceptable, but knowing that I myself have little time to read more than bits at a time (which I thoroughly enjoy), I would hate those " bits " to be all on the same subject—and possibly a subject in which I was not particularly interested.

F. R. Frampton : I was disappointed not to see an article on high speed hot water (not high pressure) in the August issue. On an average size installation this is the cheapest, quickest to install, gives the most even heat distribution, is the easiest of all systems to control thermostatically, and has so many other advantages as to put all other systems out of court. Its only real disadvantage is that there is no steam for sterilisation, although even this disadvantage can be got over.

Studies on the Function of the Casing for Mushroom Beds

Part II : Some Chemical and Physical Characteristics of the Casing Soil and their Effect on Fructification

By **Dr. B. B. STOLLER**

Water-holding Capacity of Soil and Peat : Bels-Koning (2) points out that the water-holding capacity of casing soils is an important factor, and that under the conditions tested, a mixture of vermiculite and peat (or a soil ?) with 28% moisture resulted in the best yields. For peat (9) however, the moisture-holding capacity was 80%, and the moisture had to be maintained near saturation in order for the sporophores to be initiated. But good air-penetration of the peat even at this high moisture content was achieved by mixing 3% gypsum with the peat. Peat with only 40% moisture is comparable in appearance and reaction to air-dry soil (5 to 10% moisture). The " hyperhumus " peat mentioned by Lambert and Humfeld (4) is marketed containing 65% " normal moisture content." Accordingly, the water-holding capacity depends upon the nature of the material, and especially its colloidal content. While dry soil will absorb and hold about 2/5 of its weight of water, peat will retain 2 or 3 times its dry weight of moisture. The writer is more in agreement with Bels-Koning's statement, " the better the water-holding capacity the better the yield, provided the material allowed sufficient aeration."*

Effect of Lowering Temperature for Fruiting : The benefit derived from lowering the temperature to start fructification is, according to Bels-Koning's suggestion, to increase the relative humidity. In the experiments with peat casing, it seems the effect of lowering the temperature is to increase the absorption of water by the mycelium in the casing. For example, if beds are watered when the temperature is decreased to 50° F., there are a number of disturbances in the stems of the mushrooms which are explicable on the basis of a rapid absorption of water. (Dr. Clyde Christensen, pl. path., Univ. of Minn., could not find Fusarium or other fungi which might be responsible for the disease-like condition on mushrooms submitted to him.) Upon watering, or soon thereafter, the outer part of stem breaks loose from inner part, or the stem becomes darker, or various other kinds of discolourations occur in the lower part of the stem. It seems that substances besides water are absorbed from the peat. By watering

*In the MRA Report 1950, Flegg suggests that the optimum moisture range of a casing soil must be less than, and can be determined upon the basis of, its Moisture Equivalent, which is the moisture retained in the capillary pore space by surface tension. The Moisture Equivalent (M.E.) of a soil can be measured by centrifuging or applying suction for 30 minutes to a saturated soil in order to remove moisture retained in the non-capillary pore space by gravitational forces. Since peat has a much greater capillary pore space than soil, its M.E. would be much higher, too. While Flegg finds the mean moisture content of casing soil on beds varies from 11% just before watering, to 20% just after watering, the moisture content of peats may be much greater since the M.E. is greater. The point is, the M.E. can be measured ; but Bels' *statement* not as easily.

after the temperature is raised to about 56° F. or higher, no such distortions of the stem tissue or discolourations occur. But the explanation of these circumstances as related to a rapid absorption of water is contradictory to the well-known precept of an increase in physiological activity with an increase in temperature. Accordingly, the permeability of the cytoplasmic membranes of the mycelium to water would be decreased at lower temperature. On the other hand, the atmospheric gases are more soluble in water or the soil solution as the temperature is decreased ; for example, oxygen is 8% more soluble at 50° F. than at 56° F., and is 20% more soluble than at 68° F. It is the dissolved oxygen which may be the limiting factor for greater metabolic activity ; with the increase in the rate of metabolism, the rate of absorption of water would also be greater.

Another effect correlated with lowering the temperature is the well-known phenomena of increasing pH. Soils are usually tested for pH at room temperature (75° F.) but actually the pH is more at lower temperatures. For example, peat neutralized with $CaCO_3$ had a pH 6·5 at 75° F., but when the same peat was tested with glass electrode at 55° F., the pH was 7·5. This increase in pH at lower temperatures may be due also to the greater solubility of CO_2 at lower temperatures, and also to the fact that the solubility of $CaCO_3$ in CO_2 saturated water is sixteen times greater than in water alone. So that, as the temperature is lowered the solubility of CO_2 is increased, which in turn affects an increased solubility of the **excessive** $CaCO_3$ mixed with the peat ; the increased Ca ions in solution through base exchange replace the H ions in the " micelle " of the colloid complex, so that the end result is an increase in pH. On the other hand, if the $CaCO_3$ were not present in excess, the H ions of the carbonic acid resulting from the greater solubility of CO_2, would result in a reverse of this reaction, so that the pH would decrease.

Another consequence of dropping the temperature is the effect of temperature on the viscosity of the atmospheric gases, which in turn influences the rate of air flow. It is a well-known fact that the viscosity of gases, unlike that of liquids, decreases with a drop in temperature (3). The velocity of flow of air in soils, therefore, should increase with drop in temperature. The greater air movement in the casing soil would tend to promote an increase in metabolic activity, faster evolution of CO_2, oxygenation of the soil solution, and destruction or removal of volatile substances hindering fructification. On the other hand, the viscosity of gases would increase with the rise of temperature, so that the velocity would be diminished. Under these circumstances, there would be an accumulation of factors unfavourable for development of the sporophores, unless ventilation is increased and the soil forcefully aerated. It is commonly observed that elongation of stems and retardation of caps occurs frequently at temperatures near the higher limits for fructification. The reference to peat simulating the " closed-room-effect " (8) probably has its basis in the fact that the rate of air flow in peat is slower than in loam. The peat colloidal matter is very finely divided and presents an interface far in excess of that of clayey colloids.

To summarize, the effect of lowering the temperature is to provide for an increase in the solubility of the atmospheric gases, in the rate of air flow (by diminishing the viscosity), and in pH. Such increases may induce a greater absorption of water, faster release of CO_2, better oxygenation of soil solution, and a more alkaline medium—conditions essential for fructification.

Oxygenation of Soil for Fructification : The results of combinations of an excellent cropping soil and a poor one in layers one above the other by Pizer and Leaver (7) offer an opportunity for understanding some of the experimental data presented herein (8). Only when the excellent cropping soil was placed above the poor one, and not in the reverse manner, was good sporophore production obtainable. Their explanation for this result that " the formation of sporophores on the strands requires contact of the surface of the soil with air " is in line with the observation described herein, that the air has to practically filter through the soil in order to initiate fructification. Only the soil in proximity to oxygenation is in the essential situation for fructification. At the juncture of soil and water the hyphae tend to form strands and, at the junction with oxygen, thickenings on the strands take place which give rise to sporophores by some kind of alkaline oxidation in which, possibly, a substance conducive to mycelial growth and inhibitory to fructification, is largely oxidized.

Pizer and Leaver's Classification of Soils and Peat : A comparison might be made between Pizer and Leaver's classification of casing soils according to cropping, and the use of peat as a casing according to alterations made on it. The unaltered peat yielded poorly like their Class IV. When the peat was mixed with $CaCO_3$ so that the pH was increased to about 8·0, the cropping compared to the soils of their Class III—mushrooms grew sparsely in groups or singly. When the peat was mixed in addition with gypsum, the cropping was similar to that of their Classes I and II, and there was a rapid and uniform invasion of the peat by fine hyphae.

Effect of Potassium in Casing Soil : The presence of potassium in the casing soil may be highly significant, as may be judged from the following observation. A synthetic compost was made of spent hemlock bark and spent brewery grains, containing 0·01% and 0·05% potassium, respectively. The beds were cased with soil containing 110 lb. available K per acre. The analysis of mushrooms derived from this compost compared with a similar synthetic compost to which K was added, is shown in Table 1.

It is interesting to note that the mushrooms grown on a compost practically devoid of K, had only slightly less K than mushrooms grown on composts supplied with normal amounts. On the other hand, the former had slightly more N and P. The mushrooms for the K-deficient composts had thin stems and small caps ; the yield was very poor, but unfortunately the cropping was limited to three weeks. The amount of K in the compost is so slight, that it may be assumed most of the K was derived from the casing soil. The rôle of K in the casing soil may be surmised also from the paper by Pizer & Leaver : it appears that the

K content was generally higher in the excellent cropping soil than in the poor ones. Potassium in the casing soil, while not a significant limiting factor, may contribute to higher yields. The addition of K to peat casing has been attempted in a preliminary experiment ; this will be mentioned later (9).

Colloidal Nature of Casing Materials and Cation Exchange : A final point in regards to the function of the casing soil is the consideration of the soil or peat particle itself. Loam and peat are highly colloidal materials with immense surfaces, and are therefore suitable for catalytic and *cation exchange* reactions. The activity of the mycelium in the casing material, whether directly or through the diffusion of volatile substances, is in the nature of oxidation-reduction reactions actuated catalytically. Catalytic or enzymatic reactions are markedly affected by pH, and are integrated, therefore, with the cation exchange reactions. The pH of the soil or peat is determined by the cation exchange reactions occurring therein. Cation exchange is the chemical reaction occurring in the colloidal complex of soils and peat, and refers to the exchange or replacement of *cations* attracted electrically to the *micelle* or insoluble nuclei of the colloidal complex present in soil and peat (5). If hydrogen ions are exchanged for calcium ions in the colloidal complex, the pH of the soil is diminished ; vice versa, when Ca ions replace H ions, the pH is increased. (Ca and H ions are called cations because they have positive electric charges.)

Further experimentation may reveal that the suitability of a soil for casing mushroom beds may be determined by its cation exchange capacity. The exchange capacity of peat is very much higher than that of loams—perhaps fifteen times greater, and this capacity of the heavier textured soils is greater than that of the lighter one. Considering the much greater colloidal content of peat this is to be expected (5). The fact that peat has been found suitable for casing is undoubtedly related to its content of colloidal material. It has been cited (8, 9) how peat, with a pH of 5·0 in its natural state, produced a yield as high as 1 lb. per sq. ft. ; this tends to show that a high cation exchange capacity is more significant than pH. Further evidence of the importance of the colloids and cation exchange of soils may be deducted from the data by Lambert and Humfeld (4) in which it is shown that clay loams support better yields of mushrooms than lighter soils. Pizer and Leaver's results indicate also that the cropping potential is greater of clay loams.

The Question of pH : The pH of the casing is mostly a question of whether H ions or Ca ions are dominant in the colloidal complex of the soil or peat. When H ions are dominant, then the soil reaction is acid. If limestone is applied to an acid soil, that is, one in which the colloidal complex is definitely dominant by H, a replacement or exchange occurs of the Ca for the H ions in the micelle of the complex. By supplying a surplus of Ca ions, the equilibrium is displaced in favour of the Ca ions by the law of mass action, so that replacement of H as well as other cations occurs. While other cations are present in the mushroom casing soils, Ca and H are the most abundant, and effective, at least, in determination of pH.

The desirability of " calcium soils " for agricultural purposes as well as for casing mushroom beds is explained on the basis of providing

a ' crumb ' structure, which, in turn, favours both a high moisture-retaining capacity and a good aeration of the soil. Soils containing H ions in excess, however, often develop a good crumb structure too, but the crumbs are less stable than those developed in a calcium soil. This effect of H ions may offer an explanation for the yields of mushrooms being about the same from soils varying in pH from 5·5 to 8·0. When sulphuric acid was added to casing soil to reduce the pH to 5·2, the yield was barely affected ; but when the pH was reduced to 4·4 there was a significant reduction (4). Apparently at pH 4·4 the instability of the crumb structure was sharply increased. While liming improves and stabilizes the structure of soils, still, it is known that the desirable crumb structure can be destroyed by purely mechanical effects, such as trampling, or beating by heavy rains (6). In this connection it is interesting to note the observation of F. C. Atkins (1) that " a soil which was producing 2 lb. per sq. ft. under the management of one grower was useless on a farm controlled by another accustomed to a different type of soil." Good yields with soils do not only depend on its structure, but also by the way it is handled.*

*In the MRA Report 1951, Edwards and Flegg describe experiments showing that the mushroom mycelium has a definite aggregating and stabilizing effect on casing soils. Their recommendation that watering of casing be commenced after the mycelium is grown into the soil is in line with the practice of the experienced grower, who lightly feels the surface of soil and tests it for the ' bloom '—when it is ripe for watering to bring on the crop. But Edwards and Flegg suggest this practice on the basis that watering before the mycelium has grown into and stabilized the soil would endanger the structure by reducing permeability and destroying soil aggregates. They also observe that spraying water in small amounts at 3-4 day intervals will produce less breakdown of soil structure than heavy waterings at longer intervals.

SUMMARY

1. **Moisture Capacity of Soil and Peat :** The better the water-holding capacity, the better the yield, provided the casing material is sufficiently aerated.
2. **Effect of Lowering Temperature on Fruiting :** The effect of lowering the temperature to induce fructification is to provide for an increase in the solubility of the atmospheric gases, in the rate of air flow (by diminishing the viscosity of air), and in pH. Such increases may induce a greater absorption of water, a faster release of CO_2, better oxygenation of soil solution, and a more alkaline medium—conditions essential for fruiting.
3. At the junction of the soil particle, water and oxygen, thickenings on the strands of mycelium take place which give rise to sporophores by an oxidation-reduction reaction.
4. **Effect of Potassium in Casing Soil :** Mushrooms contained about the same amount of potash, whether they were grown on a compost devoid of potash, or on a compost supplied with normal amounts. Mushrooms growing on the former compost probably derived the potash from the casing soil.
5. **The Colloidal Nature of Casing Materials and Cation Exchange :** Loams and peat are very rich in colloidal matter. Cation exchange is the chemical reaction occurring in the colloidal matter of soils and peat, in which Ca ions are exchanged for H ions, thus producing an increase in pH. It is possible that the cation-exchange capacity may determine the suitability of a material for casing.

6. **pH, ' Calcium soil,' ' Hydrogen soil ' and ' Crumb ' Structure :** The pH is determined by dominance of H ions or Ca ions in the colloidal complex of soils and peat. A soil is acid if H ions are predominant ; alkaline, when Ca ions exceed in complex. ' Calcium soils ' as well as ' hydrogen soils ' favour a ' crumb ' structure, which means high moisture-retaining capacity and good aeration of the soil. Ca soils are more stable than H soils. The crumb structure, moreover, may be destroyed by purely mechanical effects, such as trampling ; so that good yields from soils not only depend on structure, but also on the way the soils are handled.

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TABLE I. COMPOSITION OF MUSHROOMS GROWN ON A POTASH-DEFICIENT COMPOST AND ON A NORMAL COMPOST*

Compost	Total N %	Total P %	Total K %	Ash %
Normal	6·96	1·40	5·48	13·4
K-deficient	7·42	1·56	4·90	13·3

**Analysis performed by Dr. H. H. Hull, Soils Dept., Univ. of Wis., 11th May, 1945.*

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Stanley Middlebrook's Diary

Sept. 10th. For some months now we have been trying small fans in the roof vents of two Handcrafts. So far we can see no advantage whatsoever over natural circulation. The only possible advantage might be in the height of a very hot season to force some movement. This summer, however, has not been hot enough, apparently, to beat natural ventilation.

Sept. 16th. Owing to heavy supplies of manure we are having to make very deep shelf beds. When compared with level (7″) beds in the same house, the deep ones come into production earlier—presumably because of greater heat retention -but we cannot say that they bear more abundantly.

Sept. 17th. I don't offer a prize for the winning entry in a competition on " What is the most commonly asked question by a visiting layman?" It begins " How long . . . . . ?"

Sept. 22nd. I was recently given the comparative all-in costs of various heating methods by a firm specialising in stokers and oil firers. The

figures are from my memory of the conversation and may not be quite accurate, but are near enough to be important. If hand firing be taken at 100, automatic stokering would be 130, oil firing 166, and gas firing 180. All costs, including labour and saving thereof, are taken into account. The only unassessable factor is efficiency, which will vary with the job, and is claimed to be superior with oil and gas.

Sept. 29th. I appear to be losing my battle with the tray men. Last month I reported a grower doing $1\frac{1}{4}$ lb. in 24 days on 4″ trays. After reading my note he wired " I said $1\frac{1}{2}$." Well, I mustn't doubt him. I wonder whose spawn he is using.

Sept. 30th. Talking of trays, I had two batches delivered when I foolishly started experimenting with the system. One lot remains perfectly clean crop after crop; the other produces extensive mould growth all over the timber with every crop, despite thorough cleaning each time.

Oct. 2nd. Spawn makers, I gather, are vacating their easy chairs for the straight-backed variety. They are sitting up! They are even fighting fit, as I discovered to my cost at the A.G.M. One after another edged me into a corner and issued veiled threats. (Did I see them get together later, and did I hear one saying " We must stop this fellow Middlebrook, he's a ———— nuisance"?) One alleged that he was losing sales because his customers told him that I said his spawn grew *Dactylium* or something. Another urged volubly that I didn't know what I was talking about, that the method of production precluded all possibility of spawn being anything but uniform and absolutely perfect in every way. A third hinted vaguely that I didn't know how to use his spawn properly. O.K. I haven't said that any spawn grows *Dactylium* or anything else (I haven't even mentioned mushrooms in this context!) but I *have* suggested that different spawns create different conditions within the compost. I certainly have not mentioned any spawn by name. Again, I *do* suggest that all cartons of spawn as we receive them are not uniformly perfect. I admit I may not know how to use spawns properly —who does? I am prepared to back up all I've ever said that may disagree with spawnmakers' own opinions of their products and, indeed, I propose to go much further. I am told that I must make no libellous statements—a difficult condition to impose on *me*. I'm certain that when I've finished—or am finished by organised lynching—I shall not dare to attend another A.G.M.!

Oct. 6th. A visitor, looking at a barrow of discarded stalks, asked " Do you use them again?"

ESSEX WALK: Nearly 50 growers visited the plants of Messrs. R. H. Pinkerton & Son Ltd. at Rayleigh and Hockley on 23rd Sept. Mr. Bob Pinkerton and his foreman, Mr. Coke, took them round the sheds where mushrooms and rhubarb were grown alternately, the floor beds and trays in glasshouses, and the new tray plant at Hockley. One visitor was heard to remark: " One thing that always strikes me about these Show Farms is the number of gadgets and scientific paraphernalia and flocks of labour, but few mushrooms. Here at Pinkertons the impression is the minimum of such things, but lots of mushrooms." The visit was organised by Mr. J. E. R. Simons.

SEVENTH MUSHROOM LUNCH
AND
MGA ANNUAL MEETING

"You are doing an excellent job"

—Ministry of Agriculture.

Mr. John Hensley, head of the horticultural division of the Ministry of Agriculture, was the Guest of Honour at the Seventh Annual Mushroom Lunch of the Mushroom Growers' Association at the Connaught Rooms, London, on Wednesday, 1st October. Mr. Hensley was accompanied by Mrs. Hensley, and among the other guests were Mr. C. E. Hudson, horticultural head of the NAAS; Mr. R. A. Hughes, financial secretary, Ministry of Agriculture; Mr. John Goaman, senior marketing officer, Ministry of Agriculture; Dr. R. L. Edwards, MRA Director of Research; Mr. H. H. Glasscock, NAAS plant pathologist; Mr. E. H. Gardener, National Farmers' Union; Mr. H. R. Haynes, horticulture secretary, NFU; and Mr. A. S. Maney, printer of the MGA Bulletin. Members, with their wives and friends, numbered about 120.

Mr. John Stewart-Wood, MGA Chairman, who presided, remarked that there was no doubt the MGA had achieved much since Mr. Hensley's predecessor, Dr. V. E. Wilkins, was guest of honour at their first Luncheon in 1946. Membership had trebled, and all had found some very good friends in the industry through the frequent gatherings arranged by the Association. The Bulletin was eagerly awaited each month by all interested in mushroom culture, and he expressed thanks to the Editor (Mr. Fred. Atkins), who was "always untiring in his efforts to produce a very high standard in this publication," our Diarist (Mr. Stanley Middlebrook), and the many others who contributed such interesting articles (loud applause).

Growing methods were steadily improving. "Many of us have taken to the Tray System introduced from America," he said. "This system gives tremendous scope for mechanisation, thereby lowering production costs. I know my friend Mr. Middlebrook does not agree with me, but one of these days I hope to have time to step off the production line and convert him" (laughter). "We have better methods of composting, and several farms are now growing entirely on synthetic compost, which speaks very well for the work being done at the Research Station at Yaxley by Dr. Edwards and his staff.

"We have done our best to produce more and better mushrooms cheaply, but we will need all the possible protection the Ministry

can give us against foreign competition, for this year we have experienced the lowest prices since before the war and it can no longer be said we are growing a luxury crop " (hear, hear).

Before introducing Mr. Hensley, the Chairman referred to the impending departure from Worthing of Mr. " Jimmy " Gahm, expressed thanks on behalf of many growers for all the help he had given in the past, and wished him good luck in his new work.

Mr. John Hensley said he was very grateful and proud that his wife and he had been invited to the Lunch. " We are very fond of mushrooms, but it is not a bit of use complaining that we cannot afford to eat them very often, for when one thinks of the labour and difficulty which go to build up and manage the complex structure which constitutes a mushroom bed, the wonder is not so much that mushrooms cost what they do, but that human ingenuity has found a way of producing them at all on a commercial scale."

He went on to pay tribute to the small band of growers who first took the initiative and started the Yaxley Research Station. " We at the Ministry admire the work of Dr. Edwards and his staff. May I say too, if it is not too presumptuous on my part, that I hope the Mushroom Industry will continue to give financial support to its own research. I think I can say that the Ministry have not been ungenerous in supporting it themselves " (hear, hear). "As you know, the new Glasshouse Crops Research Station at Toddington will include mushrooms, but there is bound to be some considerable time before it is sufficiently developed to transfer from Cheshunt, and longer still before it can embark on new work. **It will be several years, therefore, before the research station at Yaxley becomes redundant.**

" May I conclude by saying what an excellent job the Ministry thinks the MGA has done, not only in arranging these excellent lunches but bringing growers together, pooling ideas and experiences and helping to disseminate new knowledge."

Mr. Hensley had likened the mushroom bed to a birthday cake with compost as body, casing soil as marzipan or icing, and mushrooms as candles, and when **Mr. J. R. Ashton** rose to thank him for his talk, he said he hoped that no-one would deduce from the simile that mushroom growing was " a piece of cake " (laughter).

In this, one of many cheerful groups at the Reception, are Mrs. Arthur Hovell, Mr. G. W. Baker, Mr. H. G. Boxall, Mrs. Baker, Mr. H. D. Jones and the Horticultural Secretary of the NFU, Mr. Henry Haynes.

Mr. Tom Brook, the Yorkshire grower, has a word with Mr. Eric Gardener, of the NFU. (*on the left*)

Speaking as an ordinary grower, **Mr. Ashton** referred to the uncertainty and unrest which existed in the horticultural industry to-day. "During the war, growers were undoubtedly corn-fed without realising there was a great deal of hay round the corner," he said. "Since then we have stood all kinds of interference with our job—imports, a barrage from the housewives, retailers complaining that our products were not properly packed, wholesalers complaining about the retailers and the growers, letters in the press and articles in the *Tribune* and *New Statesman* telling us what to do, Commissions and Reports, international agreements on tariffs, balance of payments and, last but not least, Government promises. Years ago the Government promised there would be stability in the industry. Where is it ? I cannot find it.

"This is not intended as a criticism of Mr. Hensley and his office; we all know that the Ministry of Agriculture lies within the sphere of influence of the politician. But I think it should be said at a function such as this, with the Trade Press present, that **the future of the Horticultural Industry lies in the National Farmers' Union's tariff case.** We know, and have known for many years, that this form of protection will give us the stability which is so badly needed" (applause).

ANNUAL MEETING

The Seventh Annual General Meeting followed the Lunch, **Mr. Stewart-Wood** (Bucks.) presiding at the outset. The Annual Report and Balance Sheet were presented by the Secretary, **Mr. Angus Watson.** The year 1951-2 had been the most successful in the Association's history in that membership had reached a record total of 546—328 growers and 218 honorary members (applause). The experimental move from Yaxley of the Trade Show had proved an immense success at Worthing, and next year it was going North, probably Harrogate. The Area Meetings, started the previous year, had rapidly become one of the most popular features in the MGA programme. The "First Thursday" Open Day at Yaxley each month continued to be an occasion for informal and mutually useful discussions. **Monthly publication of the Bulletin had been, without doubt, the most important achievement of the year.** The

general administrative work of the Association—organisation of functions, planning, answering the steady stream of correspondence dealing with all the problems facing mushroom growers—had so increased that to-day the "traffic" was three times what it was two years ago and showed every promise of continuing to increase.

When the Accounts were presented, **Mr. W. A. B. Harding** (Kent) asked whether it was necessary to include the figure of £200 for Stock of Available Literature. Mr. Watson said this stock comprised back numbers of the Bulletin, Mushrooms Galore, special leaflets and papers. Mr. F. C. Atkins added that he had assisted in the valuation of this stock: if it were sold, it would fetch £200, but that did not mean it would all be sold.

Mr. Arthur Hovell (Sussex): My attention is drawn to the figure for sale of Advertisement Space, etc., at £1,418. I consider it is a most creditable thing for an Association like this to gather so much money by its own efforts in this way. All members should note it and congratulate those concerned for gathering in such a large sum of money. (Hear, hear, and applause.)

Before vacating the chair, **Mr. Stewart-Wood** said how much he had enjoyed being Chairman. "I have met a good many of you, and I would have liked to meet many more, but Time is our enemy," he added, thanking the Committee and Secretary for the steadfast way in which they had supported him in his efforts to promote the welfare of the MGA. His successor was a very practical and dependable grower and he wished him every success (applause).

Mr. Harold G. Boxall (West Sussex): About two years ago, when Mr. Atkins invited me to occupy the Vice-Chairmanship, I was aware that it led automatically to the Chairmanship. I do not quite agree with that system, and neither does Mr. Stewart-Wood, and we have tried to evolve a system whereby the Executive Committee would choose their own Chairman, Vice-Chairman and Secretary. I think this is done in most other organisations, and at the Committee meeting held at Aylesbury in the summer it was suggested that Rule 13 should be amended to this effect. I would like to put this proposal before you.

Mr. Harding proposed, and **Mr. G. W. Baker** (Surrey) seconded, and it was carried unanimously, the only observation being one from **Mr. Stanley Middlebrook** (Yorkshire), who felt that it gave no-one not on the Committee a chance to put forward a name for the Chairmanship.

Voting papers were distributed, and later the Chairman announced the results, as follows :

Five vacancies on the Executive Committee: **J. Stewart-Wood** (Bucks.), **J. R. Ashton** (Lancs.), **R. G. Nelson** (Northern Ireland), **F. Bleazard** (Lancs.), and **G. V. Allen** (Kent).

MGA Directors on the MRA Board: **F. C. Atkins** (Northants.), **J. Stewart-Wood** (Bucks.), **McG. Bulloch** (Somerset), **General Sir Oliver Leese** (Shropshire) and **M. C. Luxmoore** (Hunts.). It was announced that **A. G. Pointing** (Yorkshire) and **Capt. G. P. Lawrence** (Hants.) had been appointed by the founder members of the MRA to represent them on the new Board.

At a subsequent meeting of the new MGA Executive Committee, Mr. J. R. Ashton (Lancs.) was elected Vice-Chairman and Mr. Angus Watson was re-appointed Secretary.

Messrs. Stephenson, Smart & Co., Peterborough, were re-appointed Auditors.

Mr. Arthur Hovell: May I take this opportunity of proposing a vote of thanks to the retiring Chairman? I feel our Chairmen are elected from the ranks of people who work hard (hear, hear). I know from personal experience that Chairmanship entails a great deal of honorary work besides what we have to do on our own nurseries, and we all owe a debt of gratitude to our past Chairman. He has had a great deal of paper work to do, and I have no doubt has incurred big telephone bills on behalf of the Association: he has had to be prepared to drop everything to show people round his farm, arrange visits of foreigners, and a host of other duties quite unrealised by members who have never filled that onerous office. Thank you, Mr. Stewart-Wood.

The Chairman opened the customary discussion on Policy. "For my part," he said, "**I would like to see more Worthing growers in the Association** and I am going to try to bring some in. Some growers think they have nothing to learn and the MGA can teach them little! One anomaly should be ironed out: that is the dual membership of the NFU. In Worthing we pay £1 1s. through our branch and one guinea through the MGA. I think if we can overcome that we shall overcome the lethargy to join the MGA." (Hear, hear.)

"Another point is that we should take an example from the Kent Surrey East Sussex Area Group. If it were followed in other districts it would do a lot towards increasing our membership. Let us invite members to the Worthing area: it would do much to cement the Association."

Mr. Harding asked for a policy of more direct contact with non-members. He wondered if permission could be given to the Kent Area to send to their members a list of non-members in their neighbourhood, urging them to contact the non-members and bring them into the MGA.

Mr. Atkins thought a greater effort should be made to form small sub-committees in each of the major growing areas. If a number of Area Groups could be formed along the lines of the Kent Surrey East Sussex Group the MGA would be strengthened and its influence and value extended considerably (hear, hear).

DISPOSAL OF COMPOST

Mr. T. T. Leach (Kent) felt that the gardeners and general public in England should be made more "compost minded." He suggested

the Publicity Sub-Committee formulate a plan to let the country know how good mushroom compost was, possibly through letters to the national Press.

Mr. Arthur Hovell: *Before we try to sell it to other people I think we should realise how useful it is to ourselves.* It is invaluable for growing other crops. For example, since the import of bulbs from Holland was curtailed we have been experimenting with growing bulbs in mushroom compost; I think the iris bulbs we have grown are equal to any which could be imported from Holland. When you consider the price of manure you will find you get your money back from mushroom compost whether or not your mushroom crop turns out well.

Brigadier J. S. Nichols (Wilts.) asked for a leaflet stating what crops could be grown on mushroom compost. He had heard, incidentally, that pigs ate trashings; they might prove a valuable by-product.

Mr. Ashton: On one small piece of land we have grown lettuce for 15 years on nothing else but mushroom compost. Also we have used it for three years under glass where it is steam sterilised, and it is giving excellent results balanced out with hoof-and-horn meal and sulphate of potash. We have tried it in Dutch lights but it had severe manganese deficiency . . . . . How good this compost is under glass for tomatoes etc. is a debatable point, and we should therefore be careful before we push it on to the public. We should get the Research Stations to tackle the job.

Col. W. A. Turner (Kent): Wye College have been using it extensively and swear by it.

The Chairman: Most Worthing growers stack the compost to weather for a year. We use it extensively, we cover bulbs with it, use it on carnations, grow strawberries in nothing but mushroom compost.

Dr. R. L. Edwards: The best disposal of mushroom compost has interested growers for some years, and I have recently tried to interest the Horticultural Experimental Station in this by-product. I wrote to the Directors of all these Stations suggesting they include it in their trials wherever possible and publish the results obtained. Some of them are already arranging to do this and in some cases I have put them in touch with growers who have supplies available. At the same time I wrote to Mr. Hudson at headquarters telling him about this and asking him to encourage these experiments. He told me they have a sub-committee which makes plans for some of the horticultural stations' experiments on a national scale, and he invited me to submit to this sub-committee detailed proposals for the best use of spent compost. *I should be glad to have information of this kind from any grower who uses mushroom compost, giving details of the crop and the quantity, time and method of application* (applause).

SHALL SUBSCRIPTIONS BE INCREASED ?

Mr. F. Bleazard (Lancs.) wondered if the Committee felt the subscription was sufficient or if there ought to be an increase. He was a member of another Association with a two-guinea subscription, but if a larger member felt it was worth 100 guineas he would contribute 100 guineas voluntarily. He suggested that members be invited to increase their subscription; it would bring in a considerable amount of money.

Mr. Atkins expressed the opinion that little extra money would come in that way. The matter had been discussed at recent Area Meetings. "We do not get quite enough money to provide our Secretary with a full-time clerical assistant," he said, "with the result that he cannot get out among the growers as freely as we would like, particularly at Area Meetings." The simplest solution seemed to be a slightly increased subscription. Honorary Members now paid £2 2s.; he proposed that the Grower's subscriptions be increased by £1 1s.

Mr. J. E. Ady (Surrey) seconded.

Mr. Leach suggested a sliding scale. He did not think any members would join if the subscription went up.

Mr. Middlebrook: An idea has just this minute come into my head—and you know what my head is ! What about charging a grower a guinea for his first year, two guineas for his second, and so on, until a grower who has been growing for eight years would pay eight guineas—when he should best be able to afford to do so ? This gives the newcomer a chance.

Mr. Harding asked how one could check how long a man had been growing. Why not a sliding scale ?

Mr. Middlebrook: We have tried unsuccessfully for years to work out a sliding scale, from the very beginning in fact.

Mr. G. V. Allen (Kent): If you do not care about the small grower then raise the subscription.

Mr. Charles Hovell (Sussex): The Worthing and West Sussex subscription is only £2 2s.

Mr. M. H. Pinkerton (Scotland): I come into contact with a great many growers who have never been contacted and have not been asked to join the MGA. Cannot something be done to approach those people who are not members of the Association ? A great many growers in Scotland have never been approached; the Committee members have never got round to see them. The Committee men should go round more.

Mr. Harding: I suggest de-centralizing the MGA rather than raising the subscription.

Mr. Middlebrook: To get more members we need a roving traveller —someone with Mr. Watson's personality. If he were not tied to the office but could meet more growers we would probably get more members, but where is the money coming from to pay his travelling expenses and to pay for the clerical assistance he would have to have ?

The proposition that the Committee consider increasing the subscription by one guinea was defeated.

Mr. Atkins: If the MGA is not worth five guineas, particularly to the new grower, then there is something wrong with the MGA. But as my proposition has fallen to the ground I would like to support Mr. Middlebrook's sliding scale if he would put the maximum at £5 5s.

It was agreed that the Committee look into the possibility of a sliding scale for subscriptions.

Mr. Atkins urged the Committee to circularise all non-members at least once a year (hear, hear).

Mr. Ady: If every member would rope in the non-members close to himself it would be the cheapest and most effective way of getting new members. I have approached four growers, and three of them are now members. If we all did that, membership would increase in no time.

Before the meeting closed, the Chairman expressed thanks for services rendered to the Association by Mr. J. E. R. Simons (Essex), the only member of the Executive who had not been re-elected (applause).

NEW (SEPTEMBER) MEMBERS

Bentley, A. J., Frearson Farm, New Eastwood, Nr. Nottingham.
Boardman, R. C., Tennisdene Nurseries, Ramsden Park Road, Ramsden Bellhouse, Billericay, Essex.
Chapman, H. B., Nestead Hall, Horley, Surrey.
Duncan, C. A., 1 Gainsborough Road, Richmond, Surrey.
Fry, Norman, Walnut Hill Mushroom Inc., Beltsville, Ohio, U.S.A.
Garner, W. R., Ridgmont Mushrooms, Moss Lane, Hesketh Bank, Nr. Preston, Lancs.
Lane, N. A., Wantage Hall, Reading, Berks.
Leo, John C., Box 96, Toughkenamon, Pennsylvania, U.S.A.
Leo, Vincent A., 241 North Union Street, Kennett Square, Pennsylvania, U.S.A.
Leslie, Neale, 629 "C" Street, Petaluma, California, U.S.A.
Summers, S., M.P., Thenford House, Banbury, Oxon.
Woods, Wm., 3 Botolph Alley, London, E.C.3.

CORRECTED OR CHANGED ADDRESSES

Batten, E. J., Glendower, Finchdean Road, Rowlands Castle, Hants.
Church Farm Nurseries Ltd., Rustington, Sussex.
Hjort, P., Wiibroe's Brewery, Helsingor, Denmark.

MGA STATEMENT OF ACCOUNTS for the year ended 31st AUGUST, 1952

1951	Dr.						*1951*
£				£	s.	d.	£
582	To Salaries and Clerical Assistance			627	15	4	
263	,, Postages, Printing and Stationery			221	11	3½	
243	,, Cost of Reprints and Advertisements			178	15	9	
8	,, Subscriptions to Trade Journals			5	1	0	
57	,, Telephone, Telegrams and Sundry Expenses			59	1	6	
146	,, Travelling and Hotel Expenses			89	13	1	
8	,, Bank Charges and Cheque Books			14	13	5	
12	,, Audit Fee			13	13	0	
2	,, Rates and Insurance			2	19	10	
74	,, Cost of Luncheon, etc.	159	4 5				
	Less Sale of Tickets	88	0 6				
				71	3	11	
54	,, Other Expenses			6	1	0	
9	,, Maintenance and Repairs			4	6	0	
—	,, Reserve for Doubtful Debts			50	0	0	
22	,, Depreciation			21	7	8	
1,485				1,366	2	9½	
12	,, Balance—being Excess of Income over Expenditure for the year			345	14	8½	
£*1,497*				£1,711	17	6	

1951	Cr.						*1951*
£		£	s.	d.	£	s.	d.	£
	By Subscriptions from Ordinary Members 1951/52	1,324	4	3				*1,076*
	Less Amounts due to NFU	160	5	7				*135*
					1,163	18	8	*941*
	,, *NFU—Amount waived for* 1949/50				—	—	—	*151*
	,, Subscriptions from Honorary Members 1951/52				250	8	6	*185*
	,, Sales of Advertising Space in Bulletin, Sales of Bulletins, Literature and M.S.I.	1,418	12	3				*853*
	Add Stock of Saleable Literature 31st August, 1952	200	0	0				*300*
		1,618	12	3				*1,153*
	,, *Less* Stock—1st September, 1951	300	0	0				
	,, ,, Cost of Bulletin, etc.	1,139	8	5				
		1,439	8	5				*1,009*
					179	3	10	*144*
	,, Other Receipts:							
	Trade Show	405	11	10				
	Open Day, etc....	36	1	0				
		442	12	10				
	,, *Less* Cost Trade Show	303	19	5				
	,, Olympia	20	6	11				
		324	6	4				
					118	6	6	*75*
					£1,711	17	6	*1,497*

LIABILITIES

1951						*1951*
£		£	s.	d.	£	s.	d.	£
49	*Subscriptions paid in advance*				22	19	6	
31	Sundry Creditors				160	5	7	
135	National Farmers' Union				-	-	-	
14	*Bank Overdraft*							
	Income and Expenditure Account:							
	Surplus brought forward 1st September, 1951	526	3	6				
526	*Add* Surplus for the year as per Income and Expenditure Account	345	14	8½				
					871	18	2½	
£*756*					£1,055	3	3½	£*756*

ASSETS

1951						*1951*
£		£	s.	d.	£	s.	d.	£
	New Office as at 1st September, 1951	205	19	4				
	Add Cost of Electricity Installation	24	2	0				
					230	1	4	*205*
	Office Equipment as at 1st September, 1951	206	1	2				
	Additions during the year at cost	7	15	0				
	Less Depreciation	21	7	8				
					192	8	6	*206*
	Library as at 1st September, 1951				4	3	2	*4*
	Stock of Saleable Literature ...				200	0	0	*300*
	Cash at Bank				214	3	3	—
	Petty Cash in hand				6	6	8½	*1*
	Sundry Debtors	258	0	4				
	Less Reserve for Doubtful Debts	50	0	0				
					208	0	4	*39*
					£1,055	3	3½	£*756*

PRICES COMING DOWN ?

J. P. Lobjoit writes in *The Fruit Grower* (9.10.52) : Half the growers in the South of England who have anything like suitable covering have gone in for mushrooms this winter.

RESEARCH FUND 1952

The following contributions have been received since July : N. W. Fell (Australia) £9 5s.; J. Kuhn (Switzerland) £6; Miss I. Ohman (Sweden) £5; H. T. Coates £5; Carbide Ltd. (Ireland) £5; C. C. Briggs £4 4s.; E. H. Jones £1 1s.; G. D. Griffin £1 1s.; R. L. Claridge 10s.; Bankers' Orders (August and September) £20; bringing the total to £1,407 6s. 5d.

ROTHAMSTED REPORT

Rothamsted has been working on mushroom problems. In the Station's Report for 1951 it is stated that work on **eelworms** has been carried out and from observations made on numerous samples of compost the Dutch identification has been confirmed as **Ditylenchus destructor.** Attempts to transfer the eelworms from mushroom compost to potatoes and mint had all failed. (T. Goodey)

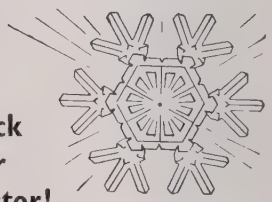
Although American workers had suggested **Mummy Disease** might be caused by a virus, none of the Rothamsted experiments had given results suggesting this was so, and some results suggested it was not. "The cause remains undetermined, but seems more likely to be some agent present in the soil that is not perpetuated within the mushroom mycelium." (Bawden & Gregory)

Publicise the Association!

MUSHROOM GROWERS ASSOCIATION · MGA ·

Here is the official monogram of the MGA, designed for the use of members on their letter headings. Stereos are obtainable at a cost of 4/6 each from the Secretary, MGA, Yaxley, Peterborough

This can wreck your Tractor!



The illustration is of a frost crystal—very beautiful but highly dangerous. It is included here to remind you to check all farm vehicles and machinery to ensure that radiators are empty when frost is about.

A "Farmers Mutual" Motor policy is an essential precaution but care is still needed. A cracked cylinder may be beyond repair and would certainly cause considerable inconvenience and delays.

● *Assets exceed £8,000,000*

FARMERS MUTUAL

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MUTUAL INSURANCE SOCIETY, LTD
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PURE CULTURE

SPAWN

WHETHER you favour the shelf, tray or flat-bed system of Mushroom Culture, you will find that the heaviest crops result from the use of 100% spawn. And, because of our exclusive technique employed for spore selection and propagation, crops are consistently of the highest possible quality—outstanding in flavour, size and colour.

It pays to use Darlington's 100% Spawn.

Our Advisory Department will be pleased to give information or guidance on Mushroom Growing to any Commercial Grower.

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Mushroom Spawn and Insecticide Specialists

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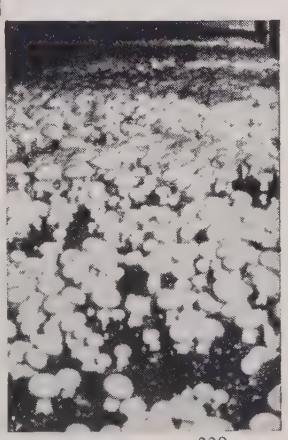

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Saves Labour and speeds Production

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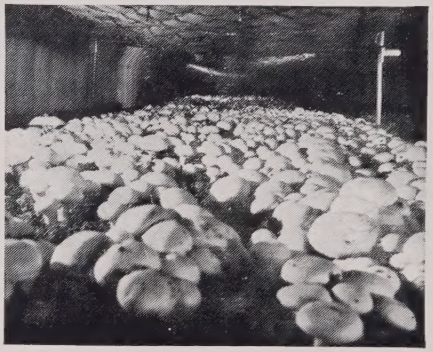

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Use 1 lb. per 100 gallons, applied at 1 gallon per 100 sq. ft. of bed.

1 cwt.	£97 10 0
56 lbs.	£50 0 0
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14 lbs.	£13 10 0
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Wet spraying costs approximately 2/- per 1,000 sq. ft.

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Give three applications at 8-12 oz. per 1,000 sq. ft. of bed or apply weekly at 4 oz.

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28 lbs. @ 5/0 lb.	£7 0 0
14 lbs. @ 5/3 lb.	£3 13 6
7 lbs. @ 5/6 lb.	£1 18 6

Dusting costs approximately 1/1 per 1,000 sq. ft.

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STEEL WINDOW CASEMENTS, unused, 8 ft. by 4 ft., with revolving central window, for sale £5 ex. Noble Mushrooms Ltd., Yaxley, Peterborough.

ONCE UPON A TIME

An " expeditious way of raising mushrooms " was quaintly described in *The Gentleman's Magazine* published in February, 1754 :

If you have an old bed of horse dung, or thatch, water it 3 or 4 days with warm water, by little and little at a time. If after this you turn up some of the dung and find any little white specks and threads of mouldiness therein, you may be sure your bed will produce : When it does so you must not pull up the mushrooms, but cut them off at the stem and it will be proper to cover the whole over with long straw, dung or thatch to secure it against cold, especially in the night ; with these precautions you may gather buttons every day, and it will not be amiss to scatter their gills and broken parts on the bed.

But as everybody is not provided of an old dung bed the following is another ready way of answering the end. In a pitt, 3 or 4 ft. from a south wall, make, in the usual manner, a bed of horse dung, which will be better, if the dung of pigeons be mixed with it ; this bed ought not to be level, but shelving, and covered ½ inch thick with fine sifted mould, and then beaten with the flat of a spade. Such a bed will infallibly produce mushrooms, not only for 3 or 4 months, as those of the gardiners, but even 3 or 4 years together. It will now and then require watering, which if done with warm water, the growth of the mushrooms will be thereby accelerated, especially if you throw on the fragments and gills of those already gathered, and if you can procure any such at first, you may expect mushrooms in 3 or 4 days ; but then it will be best to bruise the stalks with the rest, or put in a little of the specked mouldy dung above mentioned.

Horses which eat a good deal of corn furnish the best dung for this purpose, which may be to produce white specks by exposing it to the noontide sun, and moistening it a little with horse urine or warm water, before it is made into a bed.

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